The Neuroscience of Grief

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The process of grieving is not just a personal and emotional journey, but a biological one as well. The body and brain are transformed by grief, making it impossible to simply decide to stop grieving. Recognizing the physical aspects of grief is crucial to fully heal and reduce feelings of sorrow and despair. While supporting someone who is grieving can be emotionally and physically draining, it is important to prioritize self-care and take breaks when needed. However, when spending time with a grieving person, it is vital to hold space for their emotions and validate their unique journey. This newsletter explores the differences between grief and depression, the complexities of complicated grief, the role of grief triggers, and how grief affects both the brain and body. It also delves into the neuroscience behind supporting someone in grief. By gaining a better understanding of the biological processes of grief, individuals can feel less alone and better equipped to navigate the grieving process. The focus should be on holding space for the grieving person, rather than trying to force happiness upon them. This article was first published in Subkiton on December 01, 2022 (https://www.subkit.com/pernillebuelow/posts/the-neuroscience-of-grief).

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Abstract

The process of grieving is not just a personal and emotional journey, but a biological one as well. The body and brain are transformed by grief, making it impossible to simply decide to stop grieving. Recognizing the physical aspects of grief is crucial to fully heal and reduce feelings of sorrow and despair. While supporting someone who is grieving can be emotionally and physically draining, it is important to prioritize self-care and take breaks when needed. However, when spending time with a grieving person, it is vital to hold space for their emotions and validate their unique journey. This newsletter explores the differences between grief and depression, the complexities of complicated grief, the role of grief triggers, and how grief affects both the brain and body. It also delves into the neuroscience behind supporting someone in grief. By gaining a better understanding of the biological processes of grief, individuals can feel less alone and better equipped to navigate the grieving process. The focus should be on holding space for the grieving person, rather than trying to force happiness upon them.
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To many, December is a month of celebration, family-time, and long-awaited vacation. But it is also a time that makes us remember who we no longer have around us. A romantic break up, the death of a loved one, an estranged sibling. Grief is a natural process but it's certainly not an easy one. In this newsletter we will talk about the neuroscience of grief. You will notice that researchers often discuss grief in the context of attachment styles, which I think serves as a nice reminder that attachment styles are not just about forming new relationships but also about how we handle losing and grieving relationships.

Grief is a personal topic for me. During different periods in my life, I have grieved the loss of family members (through estrangement). I have experienced first-hand the discomfort that your grief can cause in others. I was asked to "put on a happy face" and to "drop the sadness". These are incredibly alienating ways of being treated during a grieving process, and certainly not in line with science.

It is important to me that one of your main take-aways from this newsletter is that grief is not just a personal and natural process, but that it is first and foremost a biological process. Your brain and body are literally changed by grief, and it is not possible to just "decide" to stop grieving.

Honoring that your body is healing is a pivotal step in the grieving process which will ultimately lessen your feelings of sorrow, yearning, and despair.

If you have spent time with a grieving person, you know that it is really difficult. It's emotionally and physically exhausting. If you are spending time with a person in grief in the upcoming holidays, do not be afraid to take some space to recharge yourself. You can only give as much as you can. Respect your needs. But on the flipside: when you do spend time with the grieving person, focus on holding space for their feelings. From someone who has spent many years dealing with grief, I can tell you that just knowing you are heard, seen, and felt is enough. When you interact with your grieving friend, be attentive, intentional, and caring. The grieving process is not going to be faster if you take them to comedy shows every night. Joy cannot

be forced. **Focus on the person's unique journey, not your need for them to be happy.**

In this newsletter we will discuss

- How grief is different from depression

- What complicated grief is

- The necessary and difficult role of grief triggers

- How grief impacts our brain activity

- How grief impacts our body

- The neuroscience of how we can help someone in grief

I hope the contents of this newsletter will help some of you to feel seen, heard and perhaps even help you gain a better understanding of what is happening in your body as you are grieving. It's a natural but incredibly complicated and exhausting process for everyone involved. Gaining this understanding has helped me feel less lonely and be better at asking for what I need during my grieving process. At the same time, I have become much better at holding space for people that are grieving without pressuring them into "happy"-inducing activities. Holding space is enough.

Let's get started.

Grief vs Mourning vs Depression

Before we do anything else, I want to define what grief is, and what it is not.

Grief represents the psychological experience to losing a loved one (through, for example, a break-up, death, or estrangement), which is characterized by sadness and yearning combined with thinking of the lost person. Given that we may never stop being sad about the loss of a person, grief is a permanent process. However, while grief is typically associated with initially extreme sadness and yearning, these feelings become less intense over time, and they become an integrated part of our every-day life. Researchers therefore talk about "acute" grief when they study the initial period of grieving that is more intensely experienced.

Mourning is the process of overcoming grief, sometimes through rituals and other behaviors, that can help one come to terms with the loss. Ultimately, mourning plays an important role in re-integrating themselves into the world with the knowledge that the lost one will not return. This is also an important part of ameliorating the initially intense feelings of acute grief into muted feelings of sadness and yearning that may only be expressed in response to grief triggers (more on those later).

Depression is a prolonged feeling of intense sadness that does not have a specific cause. In contrast, grief is triggered by the specific loss of a person. People struggling with depression often experience overwhelming shame about themselves and a general darkness in all their life. Depression is often long-lasting and needs specific intervention to improve. In contrast, in grief, the darkness one experiences is specific to the absence of a person (and not a general hopelessness). Moreover, grief may lead to shame of letting a lost one down, but is not a general sense of shame. Lastly, while depression typically needs professional assistance, recovering from grief does not. Sometimes, but often not, grief can turn into depression. In that case, a person is probably experiencing complicated grief.

Complicated grief – when the acute grief never leaves

Complicated grief, as the name implies, is, well, complicated. It occurs in around 7% of grieving people (Shear, 2012), and is characterized by a severe and prolonged state of acute grief and is often comorbid (meaning co-diagnosed) with depression. While the feelings of acute grief normally lessen over time, this transformation does not occur in complicated grief.

Past studies have identified the loss of a life partner or a child as the most intense and difficult losses, and the people grieving these types of losses are most likely to experience complicated grief (Shear, 2012). The death of a child is particularly challenging to recover from, and the bereaved parents are more likely to experience depression and physical illness as a consequence of the loss.

Complicated grief is most like post-traumatic stress disorder (compared to depression), given the event-specific trigger of the intense feelings and symptoms. However, as Shear (2012) notes people with PTSD often suffer from fear and anxiety (as a response to an event that threatened their physical health), while complicated

grief is an intense state of sadness and yearning triggered by the absence of a person.

In contrast to acute grief, complicated grief needs professional help for recovery, but the needs are different from people with PTSD and depression. Unfortunately, complicated grief is often misdiagnosed as, for example, depression, both because of the overlapping symptomology as well as due to the lack of clinical guidelines on how to diagnose complicated grief.

Are some people more at risk for developing complicated grief? Yes (Shear, 2012).

1. Losing a child or close life partner leads to a greater risk of complicated grief in the bereaved parents.

2. Loss through homicide or suicide is correlated with a greater likelihood of complicated grief in the bereaved.

3. People that have a history of anxiety, depression, insecure attachment styles, and cumulative trauma are more likely to develop complicated grief.

4. Instabilities, e.g. financial, caused by the loss.

How grief can be helped or aggravated

To complicate things, grief recovery is not a one-way process (nothing really is, I suppose). What can help a grieving person, can also prevent them for getting better. For example, holidays can be an opportunity for remembering and honoring, but it can also be a trigger of acute grief feelings, such as intense yearning and sadness. The main challenge is to use these "grief triggers" to face the grief without getting lost in it. There are two types of behaviors that are most often associated with problems recovering from grief:

1. Avoidance of grief triggers: I think we can all relate to the thinking motivating avoidance of grief triggers. Why would we want to expose ourselves to places and events that will make us relive the grief? The issue is that reliving these moments is necessary for integrating and processing the grief. Continuously avoiding the emotional pain will only reinforce the awareness of how these events and places are associated with the lost person (Seeley et al., 2022).

2. Prolonged, frustrative proximity seeking: Another type of behavior that complicates grief recovery is when a person spends significant periods of time interacting with items (such as clothing, pictures, jewelry) that reminds them of their lost person. As we will discuss later, people that are grieving display enhanced activity in the nucleus accumbens when reminded of the person they have lost – yes, you remember correctly, nucleus accumbens is a part of the reward circuity, and is involved in addiction behaviors as well as relationship bonds. The issue with prolonged, frustrative proximity seeking is similar to yet opposite of the avoidance of grief triggers: instead of being motivated by fear of the emotional pain, people are reinforced by the activated reward circuitry to continue interacting with items that make them feel closer to the lost person (Shear, 2012).

Ultimately, both the avoidance and the obsessions can prevent the natural healing process from happening and are often behaviors that are associated with complicated grief (Seeley et al., 2022; Shear, 2012).

The neuroscience of grief

So, grief is not just sadness, but it is also not equivalent to depression. It can resemble PTSD, but the root cause and behavioral expression is different. What might we expect the brain of a grieving person to look like? Well, it turns out to be a mix of all the above.

One research group used a technique called fMRI to scan the brain activity of people that were in the acute phase of grieving a recent romantic breakup (Najib et al., 2004). When people were thinking about the partner they had broken up with, the researchers observed changes in the activity levels of many different brain regions. Frankly, there is no way I can list them all here without boring you.

So at the risk of sounding superficial this is how I would summarize their results: in the acute phase of grief, the brain resembles an activity profile that is a mix of sadness and depression.

Specifically:

- Similar to feeling **sad**, acute grief leads to greater activity in several brain regions, including the cerebellum, posterior brainstem, posterior cingulate cortex, when thinking of their lost partner. However, they also saw distinct differences in some regions that have not previously been identified in sadness studies.

- Similar to feeling **depressed**, acute grief leads to reductions in activity of brain regions lying in the frontal-anterior regions of the brain. However, in stark contrast to the depressed, acute grief is associated with reduced brain activity in other key regions as well, including the amygdala, insular cortex, and ventromedial prefrontal cortex (vmPFC), regions that normally display increased activity when depressed. The researchers also found a significant correlation between grief level and brain activity decrease. In other words, the more a person was grieving, the more reduced the activity of the brain was. This reduction may in part explain why we experience "dull" or "numb" sensations of joy during periods of grieving.

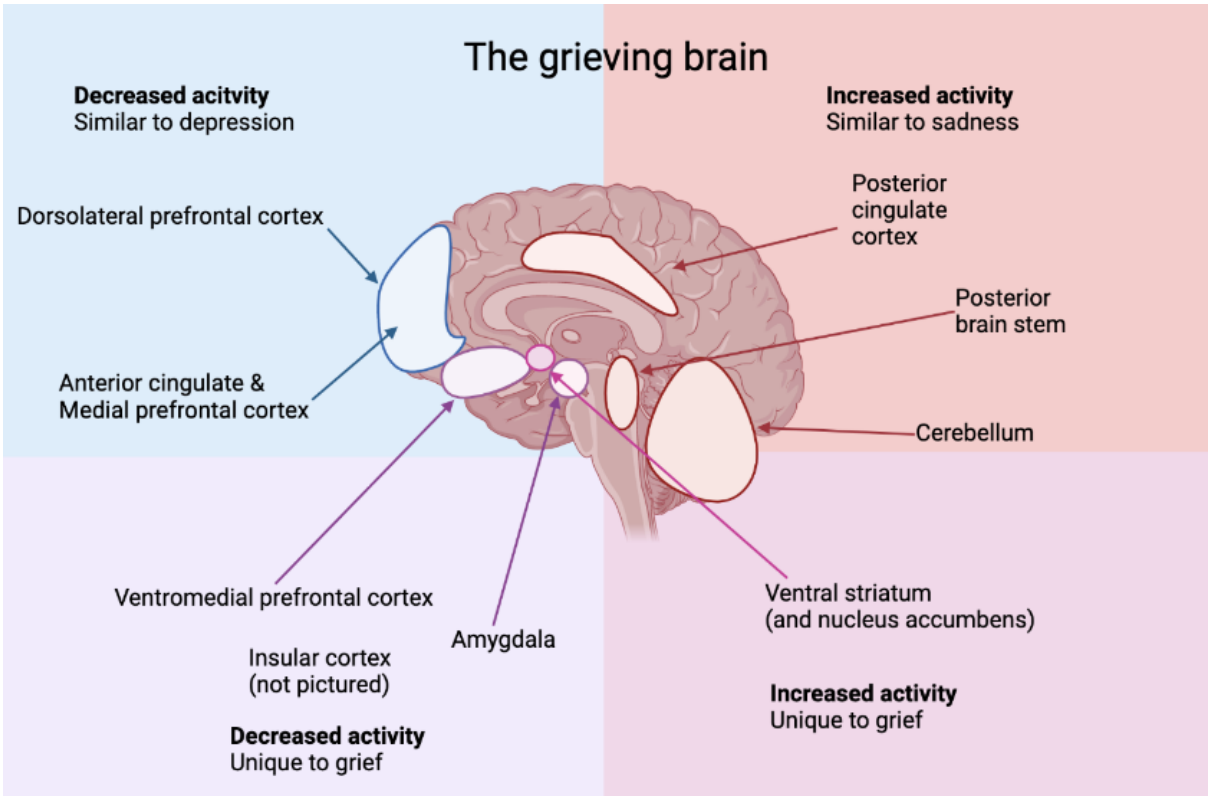

Figure 1: the grieving brain can be divided into four categories depending on whether the activity profile is similar to or different from sadness and depression.

As I mentioned earlier, the reward circuitry is uniquely activated in the grieving brain, which may prevent the healing process. In comparison to acute grief, reminders of a deceased led to increased activation of the nucleus accumbens and, in another study, the ventral striatum (which encompasses the nucleus accumbens) in people with complicated grief (O'Connor et al., 2022; Blair et al., 2022). **Thus, complicated grief has a unique activation of the reward circuity when reminiscing on a lost person**. Perhaps they are reminded of all the ways the deceased brightened their days, or alternatively, there is a certain reward associated with the pain itself. You know that feeling of "good pain"? This is a great article from the perspective of grief and loss on how grief can feel as a "good pain". Interestingly, pictures of the deceased loved one triggered activation of brain regions normally associated with physical pain in both complicated and non-complicated grievers. As previously shown, physical and social pain is rooted in the same brain regions, and that's why you can sometimes feel an emotional pain as strongly as a physical one (Eisenberger, 2012).

What I found most fascinating about diving into the neuroscience literature on grief was that researchers found unique brain activity profiles depending on which feelings were more pronounced in the subject. In other words, **the distinct version of our grief is reflected as a unique brain activity profile.** People that have lower or higher grief levels display distinct brain activity profiles and people who experience more sadness have different brain profiles than people that grieve with high yearning (Blair et al., 2022; McConnel et al., 2018; Najib et al., 2004). Moreover, grief appears to manifest differently in the brain depending on the nature of the grief: a romantic break up is associated with alterations in brain activity that are different from someone who is grieving a deceased person (Fernández-Alcántara et al., 2020; Najib et al., 2004).

Despite these many changes in our brain researchers are not finding that grieving people have reduced cognitive functions (for example, that they are not less able to pay attention or more easily distracted) (Verhallen et al., 2021; Hall et al. 2014). I find this surprising, because depression is associated with reduced executive functions (Pan et al., 2018), and so is high levels of stress (Girotti et al., 2018; Starcke et al., 2016) (although sometimes stress can boost your cognitive abilities). What does this mean? It may imply that grief somehow does not impact the parts of the brain that are most important for executive functions.

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When grief makes you sick

Have you heard of the saying “a broken heart can kill you” or of the broken heart syndrome? While this is actually true, broken heart syndrome is typically temporary. It’s often brought on by stressful events (e.g. a romantic break up or decease of a loved one), and is characterized by sudden, intense chest pain and shortness of breath due to irregularities in the way parts of the heart is functioning. People who are grieving a deceased loved partner or a romantic break up are also more likely of experiencing their first heart attack (Kriegbaum et al., 2013).

Why does grief make you more likely to experience your first bout of heart attacks and broken heart syndrome? The reason is likely inflammation.

Just like people suffering from depression, grief impairs your body’s innate and adaptive immune system and leads to higher levels of pro-inflammatory cytokines (Fagundes et al, 2019). In other words, when you grieve, your body is in a chronic inflammatory state. Chronic inflammation is not a good thing. It can cause Type 2 Diabetes, Alzheimer’s Disease, some cancers, Rheumatoid Arthritis, and, obviously, cardiovascular diseases (Fagundes and Wu, 2020). It’s therefore not that surprising when studies find that grief correlates with higher mortality and premature morbidity.

Why does grief lead to more inflammation? This is really the more complicated question, and the answer will be multifactorial (Fagundes and Wu, 2020).

1. Grief leads to an unhealthier lifestyle in the first year after onset. Grieving people tend to eat less healthy food and eat at more irregular times. When we grieve, we also tend to drink more alcohol.

2. Grief causes stress, and chronic stress impacts our immune system. Indeed, chronic stress leads to similar increases in pro-inflammatory cytokines, and health outcomes (for example, type 2 diabetes is often associated with chronic levels of higher stress).

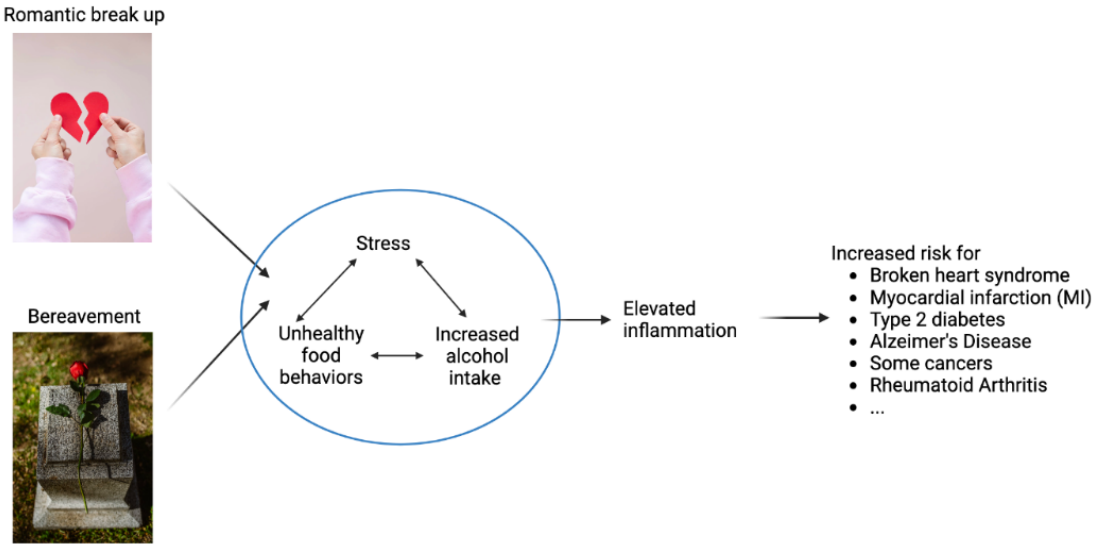

Figure 2: Grief induced by a romantic break up or the death of a romantic partner triggers a triad of behaviors, including unhealthy and irregular food intake, increased alcohol intake and elevated stress. Each of these factors reinforce each other, thereby exacerbating the behaviors and ultimately the consequent inflammation levels are further elevated. Inflammation, often due to increased levels of pro-inflammatory cytokines, is associated with the onset of various diseases, including heart problems, type 2 diabetes, cancers, autoimmune diseases and Alzheimer's Disease.

Interestingly, according to some studies, our attachment style can determine our inflammatory (as well as psychological) response to grief (LeRoy et al., 2020). One group of researchers found that people with an anxious attachment style expressed poorer mental health and higher inflammation in the months following the death of a life partner. This makes total sense, right? Anxious attachment styles increase your cortisol levels, which could, as we discussed above, lead to higher inflammation and ultimately disease (Smyth et al., 2015; Kidd et al., 2013). However, elevated inflammation is not found in people with an avoidant attachment style (LeRoy et al., 2020). In fact, these people tend to report better mental health status wile grieving. There is a lot of reasons why that can be. One major reason is that avoidant attachment generally reduces focus on the negative and focuses on the future (remember how these people tend to be "future oriented" in their relationships?). Instead of ruminating on their loss and grief, they may rather focus on next steps in their life. This is not to say that avoidantly attached people do not grieve, but rather

that they have some coping strategies that are particularly effective to maintain a healthy body and mind during the grief process.

The neuroscience of how we can help people that are living through grief

Living through grief is difficult. Watching someone living through grief is equally as difficult in its own way. Given that grief is a natural process, something that everyone experiences at one point or another, it is understandable that sayings like "time heals all wounds" is often used to soothe people in grief. Yet, I beg to differ, for personal and scientific reasons. There is more that we can do than just wait. Personally, and anecdotally, holding space for a grieving person is one of the most powerful actions you can take. I know "holding space" has become a hot topic these days which is simultaneously fortunate and unfortunate. Fortunate because it creates awareness, unfortunate because it can appear as "fluffy" and unscientific. Let's address that.

What does it mean to hold space? If you google 'holding space definition' **you. get. so. many. hits.** Like, 422,000,000 hits. So, if you weren't convinced already, 'holding space' is certainly a popular term. Anyhow, a popular way of defining 'holding space' is that it is the process of being present and intentional about someone else's emotions without judgement, while, importantly, remaining self-aware. And that sounds nice, right? I think the major issue with our current 'holding space' epidemic (is it too soon to joke about epidemics?), is that we say it, instead of doing it. I came across this excellent article on The Daily Beast on the matter which dives into how 'holding space' has become a part of the rising 'therapist lingo' that has surged over the last few years.

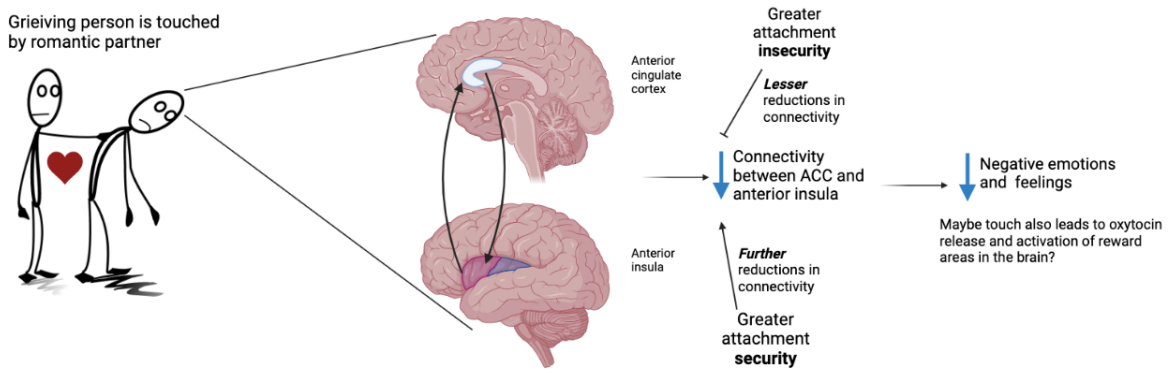

Figure 3: the touch of a romantic partner reduces the connectivity between the anterior cingulate cortex, a region involved with emotional expression, and the anterior insula, an important region for interoception and self-awareness. The touch-induced reduction in ACC-insula connectivity is thought to reduce the experience of negative emotions. It is also possible that touch from the romantic partner leads to release of oxytocin and activation of areas of the brain normally associated with feelings of reward.

But here's the thing: from a scientific perspective, holding space is very simple. At the neuroscientific level, 'holding space' is as simple as holding a person's hand as they are reminiscing and grieving.

One research group found that holding a romantic partner's hand while looked at pictures of a deceased loved one, reduced activity in the anterior cingulate cortex (ACC) and anterior insula which was specific to being touched and not just the presence of the romantic partner (Kraus et al., 2019). The astute reader may have noticed an inconsistency with Figure 1: according to other research groups, the ACC and insula display reduced activity in grieving people. However, that's not what Kraus et al. (2019) found, in fact, they found the opposite: that bereaved people displayed increased activity in the ACC and insula when seeing pictures of the deceased. Why the difference? The studies mentioned earlier focused exclusively on people that were grieving the death or a break-up of a romantic partner. Perhaps losing a non-romantic family member or friend elicits a different type of brain activity profile. Hurray. It just continues to get more complicated. However, the important message I want you to walk away with is this: **social touch from a romantic**

partner not just attenuates activity in grief-triggered brain regions, but also reduces the strength of the connection between AAC and anterior insula. This is meaningful because it tells us that the way the brain regions communicate with each other is directly modulated by social touch. Anterior insula is important for interception and self-awareness, and reduced coupling with ACC may lead to a reduction in the intensity of the experienced emotional feelings (e.g. despair). I think it is also interesting to consider how touch by a romantic partner may trigger release of oxytocin and activate areas of the brain associated with rewards, which we know is implicated in attachment formation as well as one of the reasons for the better physical health experienced by couples.

Intriguingly, if the bereaved had a stronger attachment security with their romantic partner, it led to even greater reductions in the ACC-insula connectivity (Kraus et al., 2019). **In other words, the quality of your attachment style will directly modify how effectively a romantic partner's touch can relieve your grief.** Again, we are faced with the importance of attachment styles in our emotional and social life.

Outside of the simple actions such as 'holding space' and social touch, researchers have identified therapeutic strategies that are particularly effective for grieving people. One of these strategies include cognitive behavioral therapy (CBT) that uses mindfulness (Huang et al., 2021). A group of 19 bereaved individuals underwent 8-weeks of mindfulness-cognitive therapy, which ultimately changed not just their brain activity but also their self-reported anxiety and emotion regulation abilities. Interestingly, the effects on the brain were specific to when people were resting, and not when they experienced emotional arousal (for example a strong reminder of the deceased). Likely what happened was that the participants were less likely to experience "mind-wandering", that is, when your brain spontaneously thinks of something, in this case, the deceased or other negative events associated with the death and loss. I will talk more about how exactly mindfulness strategies can change your brain, body, and mind in future Mental Health newsletters.

When it comes to complicated grief, counseling from professionals and even antidepressants are recommended. As I mentioned early in this article, a huge feat is to distinguish complicated grief from depression. Complicated grief required targeted treatments that address the loss rather than a general sense of hopelessness (although a person of course can experience both) (Shear, 2012). I will refrain from sharing the research on therapies for complicated grief here, and

instead encourage you to reach out to a professional for assistance if you or someone else is struggling with complicated grief.

As always, I am reachable and ready to listen, converse, and consult.

Final notes

Grief is tough. It is rough. It hurts. And it can feel so lonely. Finding a community is key. Your romantic partner or close friends may be all you need. But some people need more, and in some cases do not even have a romantic partner or close friends. One bad-ass woman started a community for grievers after the loss of her own child. I encourage you to read this article describing the motivation, principles and experiences of people that have spent time on the farm to process and live with their own grief. Yet another reminder that communities are powerful ways to overcome even the most devastating circumstances.

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